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(54) **Electrical connector assembly.**

(57) A connector assembly is composed of a housing component (20) having connection contacts (40) accessible via an opeing (2l). An operating member (30) locates with the component (20) and has a plate-like body (33) engaging in the opening (2l) thereof. The body (33) presents an array of cams (35) which compress the contacts (40) when the member (30) is displaced to urge the body (33) within the opening (2l) to an initial extent. A further opening (3l) in the operating member (30) receives a group of conductors (5l) which can be inserted fully and freely into channels (36) in the body (33) beneath cantilevered portions (4l) of the contacts (40) compressed by the cams (35). The cams (35) are dimensioned to release the contact portions (4l) which then grip the conductors (5l) when the member (30) is further dispalced to insert the body (33) further within the opening (2l).

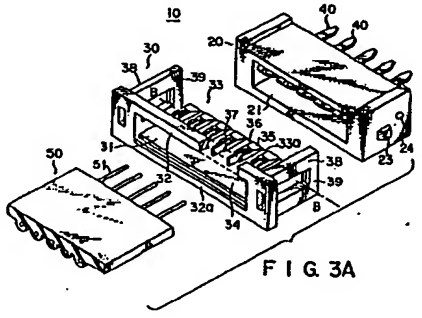

FIG. 3A

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Description

ELECTRICAL CONNECTOR ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a connector assembly into which a group of conductors, such as are carried by a flexible ribbon cable, are inserted for electrical connection.

BACKGROUND OF THE INVENTION

A known form of connector assembly is illustrated in Figs. I and 2 of the accompanying drawings and is described in more detail hereinafter. In this known assembly, a group of conductors assembled as a flexible ribbon cable are pushed into resilient contacts in a housing to urge gripping portions of the contacts apart. This type of connector suffers from serious disadvantages principally the conductors are prone to be deformed or damaged during their insertion.

A general object of the present invention is to provide an improved form of connector assembly.

SUMMARY OF THE INVENTION

According to the invention, a connector assembly comprises a first component in which an array of resilient contacts are contained, the contacts being accessible via an opening in the component; a second component located to the first component for displacement in relation to the first component, the second component having a body provided with cam means engaging within the opening of the first component and having an opening into which conductors can be inserted for access to the first component, the cam means being arranged such that, when the body of the second component is partially inserted into the opening of the first component, the cam means engages with the contacts to establish clearance for permitting the conductors to be fully inserted into the first component and when the body of the second component is fully inserted into the first component the contacts are released by the cam means to allow the conductors to be gripped by the contacts.

The provision of the two component housing with the cam means to ease the contacts and allow the conductors or wires to be inserted fully but quite easily and without force exhibits significant advantages over the known single part housing.

Conveniently, the body of the second component - which acts as an operating member selectively controlling the operation of the contacts of the assembly - has a flat supportive surface leading to the opening of the second component over which the conductors can be guided into apertures, channels or the like corresponding to the contacts. The cam means may comprise individual cam projections at sides of the channels. These projections can gently compress cantilevered contact portions of the contacts which incline towards the body.

Ribs on the cams may locate between adjacent contacts when the components are fully brought together to isolate the contacts from one another. As to the contacts themselves preference is for a simple design where the contact portions thereof are connected via a bent region to a main body portion which is fixed in the first or housing component and is extended as a terminal projecting outside the assembly. Further curved end regions of the contact portions may be engaged by the cams initially and then released to spring out and grip the conductors. Cut-outs in the end regions are desirable to provide sharply defined edges for better contact with the conductors.

Conveniently, the second component or operating member has a rectangular front frame defining the opening therein and one rail of this frame then connects directly with the body. Apertured side walls can project alongside the body and engage over corresponding side walls of the first or housing component. The side walls may interengage as a snap-fitting and projections can engage in the apertures of the side walls of the operating member to act as latches preventing unintended detachment of the components from one another and guiding the displacement of the operating member during the progressive insertion of the body in the opening.

The invention may be understood more readily and various other features of the invention may become apparent, from consideration of the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:-

Fig. I is a perspective view of part of a connector assembly of the conventional type;

Fig. 2 is a cross-sectional view of the conventional assembly with conductors of an associated flexible cable inserted therein;

Fig. 3A is a perspective view of a connector assembly constructed in accordance with the invention;

Fig. 3B is a sectional end view of one of the components of the assembly shown in Fig. 3A, the view being taken along the line B-B in Fig. 3A;

Fig. 4 is a perspective view of one of the contacts of the connector assembly of Fig. 3: and

Figs 5 to 8 are cross-sectional views of the connector assembly of Fig. 3 showing the components in different operating positions.

Fig. I shows a conventional connector assembly 80 together with an associated flexible cable 70. The flexible cable 70 is composed of an array of conductors 7I formed on one surface of a sheet of insulation 72 and covered with another insulation layer 73. To permit the cable 70 to be connected to the assembly 80, the insulatons 72 and 73 are stripped back over an end portion to expose the conductors 7I as shown.

The assembly 80 has a housing 8I containng an array of connection contacts 82 disposed in cavities

in the housing 8I so that their disposition correspond to that of the conductors 7I of the cable 70. Each connection contact 82 s formed from a resilient strip shaped to possess a base portion 83 and a support portion 84 opposite the base portion 83. The portions 83, 84 engage side walls of the associated cavity. A bridge portion interconnects the base and support portions 83, 84 and abuts a base wall of the cavity. A cantilevered contact portion 84a, 84b connects with the support portion 84 and a terminal portion 85 projects out from the housing 8I. The contact end region 84a abuts against the base portion 83. The end region 85a of the terminal portion 85 is intended to be inserted into a corresponding through hole of, for example, a printed circuit board, for connection therewith. To connect the conductors 7I of the cable 70 to the assembly 80, the conductors 7I are forced individuaiiy into a pressure contact zone between the base portions 83 and the end regions 84a of the connection contacts 82 and Fig. 2 shows one of the conductors 7I after insertion into the connector assembly 80. Each conductor 7I must be urged in place, between the base portion 83 and the end region 84a of the contact 82 against the resilient recovery force of the bent portion 84b, 84a of the associated contact 82, to open up a gap sufficient to trap the conductor 7I between the portion 83 and the end region 84a.

As a result, deformation can occur and the conductor surfaces can be marred or damaged. Furthermore, where the cable 70 has a large number of conductors 7I, then a greater insertion force is necessary than would be the case wth a small number of conductors 7I. Repeated insertion and withdrawal of the cable conductors 7I tends to weaken the contact pressure and the efficiency of the assembly suffers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A connector assembly representing an embodiment of the invention is illustrated in Figs. 3 to 8. As shown in Fig. 3A, the connector assembly is designated I0, the associated cable to be connected therewith is designated 50 and the conductors of the cable 50 are designated 5I. The assembly I0 is composed of a multi-part housing with first and second components 20, 30. The first component 20 houses connection contacts 40 and is intended to remain fixed in position while the second component 30 forms a movable operating member. The housing component 20 has an opening 2I in which the connection contacts 40 are arranged as a parallel array. As shown in Fig. 4, each connection contact 40 has a main body portion with a terminal portion 42 at one end. A contact portion 4I is connected via a V-shaped bent region 4Ib to the other end of the main body portion. The contacts are formed from resilient metal strips and the contact portions 4I permit individual conductors 5I of the cable 50 to be gripped and pressed in a direction perpendicular to that in which the cable conductors 5I are inserted into the housing component 20 through the opening 2I. As also shown in Fig. 4, an end region 4Ia of the contact portion 4I is further bent as an inward curve towards the main body portion to provide a contact face for the conductor 5I. A cut-out 43 is provided in the bent curved region 4Ia. The terminal portions 42 of the contacts 40 project outwardly beyond the housing component 20 and the end regions 42a of these terminal portions 42 can locate in holes in a printed circuit board for example for connection with the circuitry thereof.

The operating member 30 includes a rectangular frame 32 with an opening 3I corresponding to the opening 2I of the housing component 20, and a main plate-like body 33 extends from a bottom rail 32a of the frame 32 in a direction perpendicular to the frame 32. The body 33 has dimensions so as to be received within the opening 2I of the housing component 20. The body 33 has a flat upper surface 34 leading inwardly from the bottom rail 32a of the frame 32 and an array of cam projections 35 spaced apart at a predetermined intervals. The projections 35 extend from the inner end 33a of the body 33. An elongate channel 36 is disposed between adjacent cam projections 35 and has a bottom surface flush with the flat front surface 34. The distance between the adjacent cam projections 35 is selected so as to permit the forward ends of the conductors 5I of the cable 50 to be located in respective channels 36. As shown particularly in Fig. 3B, an upstanding rib 37 is formed on each cam projection 35. When the member 30 is inserted into the housing component 20, each rib 37 is located between adjacent connection contacts 40 to isolate the connection contact 40 from one another. Two side walls 38 with rectangular openings therein extend along the sides of the body 30. These side walls 38 fit alongside the sides of the housing component 20. The sides of the housing component 20 are provided with projections 23, 24. Each projection 23 locates in the opening in the associated side wall 38 to prevent the member 30 from being inadvertently removed from the associated housing component 20. The end rails 39 of the side walls 38 can be snap-fitted over the component 20 to locate between the projection 23 and 24. The projections 23 also guide the displacement of the operating member 30 vis a vis the housing component 20 when the components 20, 30 are being fitted together.

Fig. 5 shows the operating state in which the inner end of the body 33 of the operating member 30 is partially inserted into the opening 2I of the housing component 20. As shown in Fig. 5, the bent regions 4Ib of the contact portions 4I of the contacts 40 are unstressed. The curved end regions 4Ia of the contacts 40 thus locate at a lower level than the upper surfaces 35a of the projections 35 and in a position relative to the flat surface 34, to subject conductors 5I thereon to adequate resilient contact pressure when the body 33 is fully inserted to ensure a good reliable electrical connection.

Upon further insertion of the body 33 into the housing component 20, the end regions 4Ia of the contact portions 4I of the contacts 40 are raised onto the upper surfaces 35a of the cam projections 35 as shown in Fig. 6. If, in this state, the conductors 5I of the cable 50 are introduced into the respective channels 36, as shown in Fig. 7, the conductors 5I

can be easily inserted below the end regions 4la without engaging the contacts 40. Further insertion of the body 33 into the housing component 20 causes the upper surfaces 35a of the projections 35 to disengage from the end regions 4la of the contact portions 4l of the contacts 40. The contact portions 4l can now spring towards the support surface 34 to bring the end regions 4la into pressure contact with the conductors 5l, under the resilient force of the contact portions 4l, as shown in Fig. 8. The provision of the cut-outs 43 ensures the conductors 5l are pressed by the edges of the cut-outs 43 rather than by the smooth exterior of the end regions 4la. Thence, each conductor 5l is positively in contact with the resilient contact portion 4l of its associated contact 40 to provide positive electrical connection.

Between the completion of the insertion of the conductors 5l as shown in Fig. 7, and the completion of the insertion of the body 33 of the operating member 30, as shown in Fig. 8, the conductors 5l are not moved. When each conductor 5l is engaged by the moving contact portion 4l of its associated contact 40 no other relative movement occurs and there is hence little friction between the conductors 5l and the contacts 40 so that the conductors 5l are not marred or damaged. Also, in further contrast to the conventional arrangement, the insertion of the conductors 5l involves little force and no deformation or damage is likely.

Although the conductors 5l would normally be of circular cross-section other cross-sectional shapes are feasible and indeed the configuration of the aforementioned contact zones of the contacts 40 can also be altered. Furthermore, the conductors to be connected to the connector assembly may not necessarily be wires or strands but instead they could be plug pins or of any ordinary type not necessarily associated with a flexible cable.

Although in the illustrated embodiment the cam projections 35 are formed at each side of the channels 36 it is possible to provide a cam projection 35 on just one side of each channel 36. Instead of the provision of the channels 36 to provide clearance for inserting the conductors 5l other measures can be adopted. For example, a respective cam projection may be located right beneath a corresponding connection contact and a tunnel-like passage can then be formed in the cam projection itself so that the conductors may be inserted into the passages when the contact portions of the contacts are engaged with the operating surfaces of the cam projections.

Claims

1. A connector assembly comprising:

a first component (20) in which an array of resilient contacts (40) are contained, the contacts being accessible via an opening (2l) in the component (20), characterized by a second component (30) located to the first component for displacement in relation to the first component (20), the second component having a body (33) provided with cam means (35) engaging within the opening of the first component and having an opening (3l) into which conductors (5l) can be inserted for access to the first component; the cam means (35) being arranged such that, when the body of the second component is partially inserted into the opening of the first component, the cam means engages with the contacts to establish clearance for permitting the conductors to be fully inserted into the first component and when the body of the second component is fully inserted into the first component the contacts are released by the cam means to allow the conductors to be gripped by the contacts.

2. An assembly according to claim l, wherein the second component (30) has a frame (32) defining the opening (3l) and the body (33) has a flat support surface (34) leading inwardly of the opening and over which the conductors (5l) are guided during their insertion.

3. An assembly according to claim l or 2, wherein the body (33) of the second component (30) is provided with individual channels (36) in operative association with the cam means (35) for receiving the conductors (5l) and providing said clearance.

4. An assembly according to claim 3, wherein the cam means is in the form of cam projections (35) on either or one side of each channel (36).

5. An assembly according to claim 4, wherein upstanding ribs (37) extend upwardly from each cam projection (35) and the ribs (37) locate between adjacent contacts (40) when the body (33) in inserted into the first component (20).

6. An assembly according to any one of claims l to 5, wherein the second component (30) has side walls (38) which locate externally alongside corresponding sides of the first component and latching means (23, 24) acts between said side walls and sides to prevent detachment of the components from one another and guide the relative displacement of the components.

7. An assembly according to claim 6, wherein the side walls (38) of the second component are provided with apertures and are adapted for a snap-fitting location with the sides of the first component.

8. An assembly according to any one of claims l to 7, wherein each contact (40) has a main body portion fixed in the first component, a terminal portion (42) projecting out of the second component and a cantilevered contact portion (4l) extending at an angle to the body portion, the contact portions of the contacts being initially engaged by the cam means and subsequently serving to grip the conductors.

9. An assembly according to claim 8, wherein each contact portion (4l) has a U or V-shaped bent region (4lb) connected to the body portion and a curved free end region (4la), the curved regions (4la) being initially engaged by the cam means (35) and urged towards the body portion and subsequently springing away from the body

portion after release by the cam means (35) to grip the conductors.

10. An assembly according to claim 9, wherein the curved end regions (41a) of the contacts (40) have cut-outs (43) positioned so that the edges of the cut-outs (43) engage with the conductors (51).

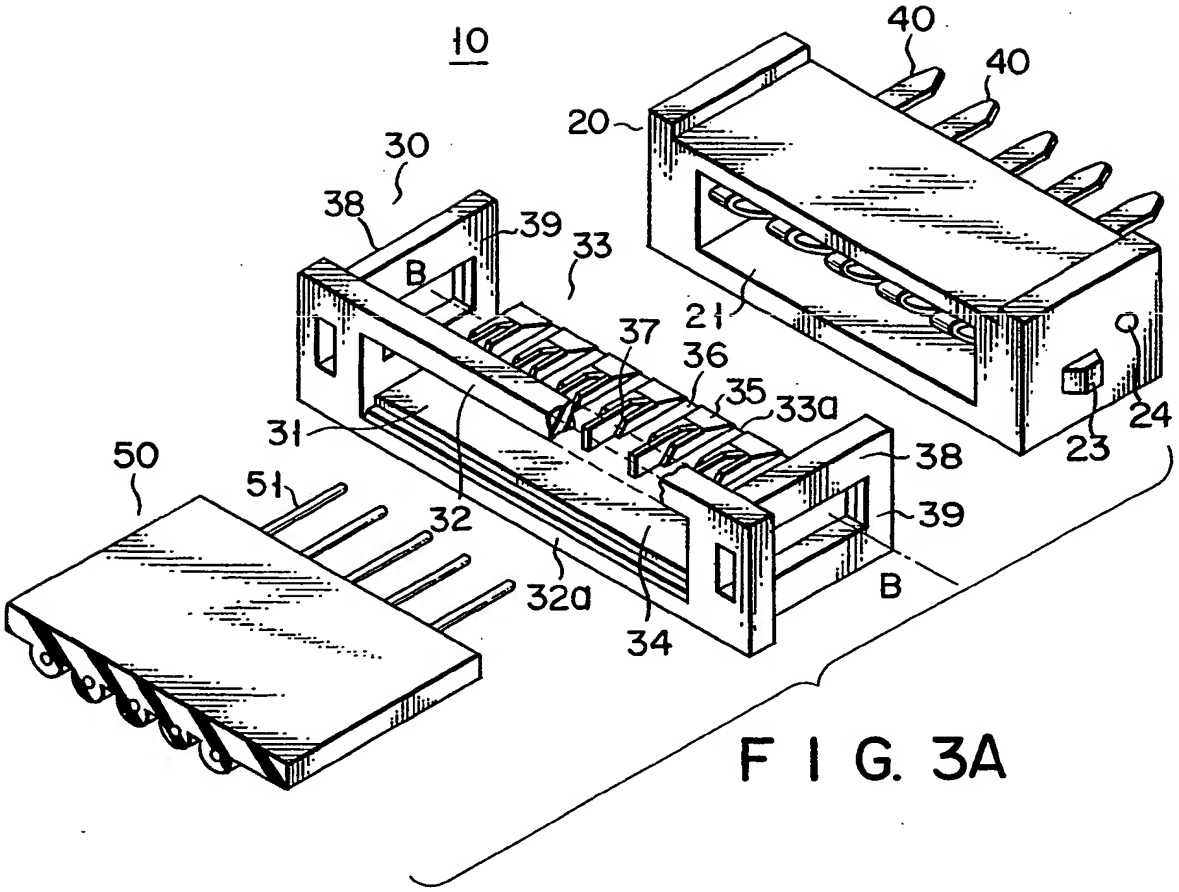


FIG. 3A

FIG. 3B

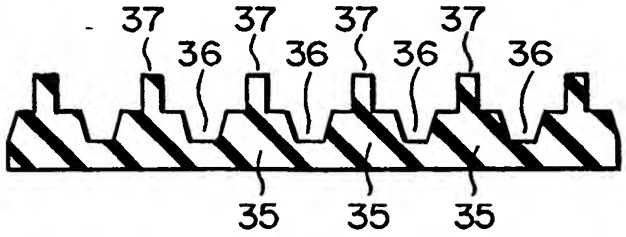


FIG. 4

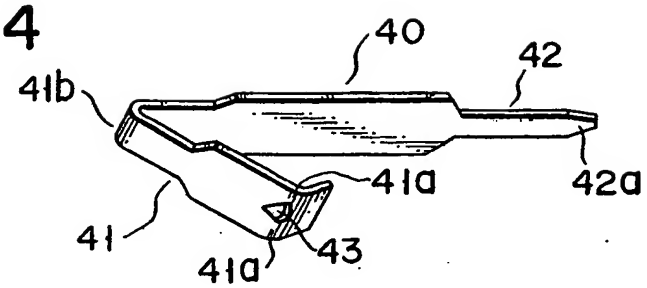
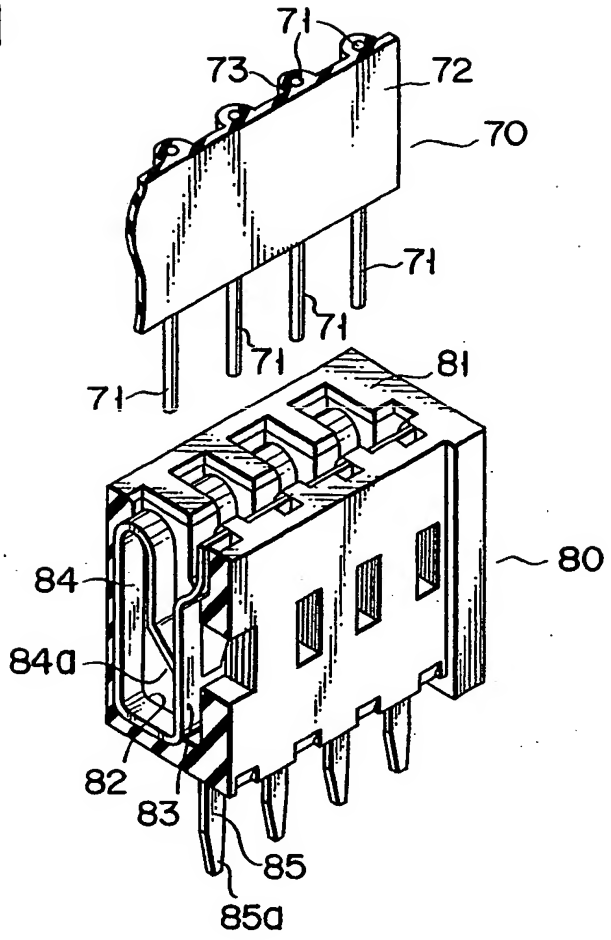


FIG. 1


71
73
72
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71
71
81
80
84
84a
82
83
85
85a

FIG. 2

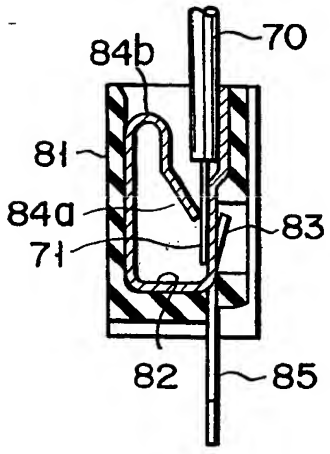
70
84b
81
84a
83
71
82
85

FIG. 5

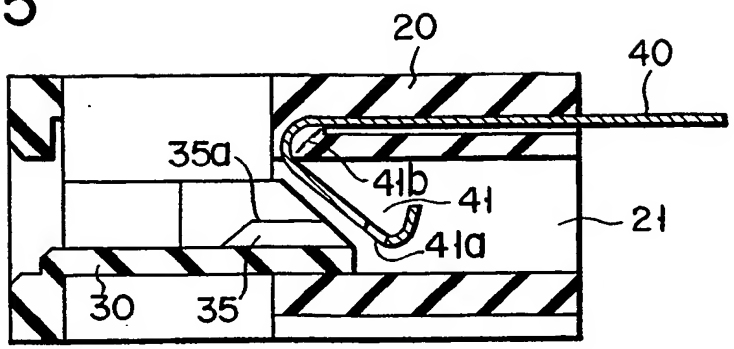

FIG. 6

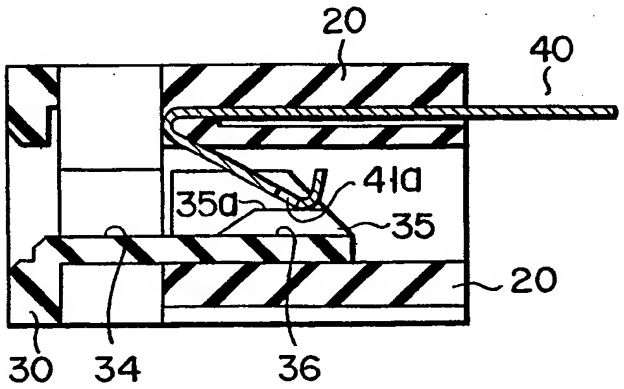

FIG. 7

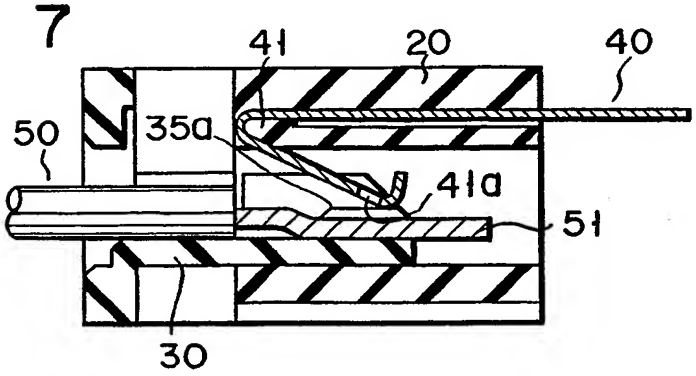

FIG. 8